CLAIMS

1. A process for plasmonic-based high resolution color printing, the process comprising:
    a) providing a nanostructured substrate surface having a reverse structure geometry comprised of nanopits and nanoposts on a support;
    b) forming a conformal continuous metal coating over the nanostructured substrate surface entirely to generate a continuous metal film comprising a solid metal substrate and nanostructures on the solid metal substrate for the plasmonic-based high resolution color printing, wherein a periodicity of the nanostructures is equal to or less than a diffraction limit of visible light;
    c) separating the continuous metal film from the nanostructured substrate surface by peeling the continuous film formed over the nanostructured substrate surface entirely, from the nanostructured substrate surface; and
    d) providing a broadband visible light source so that plasmonic resonances generated by the nanostructures when the nanostructures are irradiated with the visible light from the visible broadband light source absorb one or more colors of light, and the nanostructures reflect one or more other colors of light, thereby generating a color image, wherein the visible light is a broadband light.

2. The process according to claim 1, wherein the support comprises a material selected from the group consisting of a polymer, a metal, a metalloid, and combinations thereof.

3. The process according to claim 1, wherein the support is at least substantially transparent to visible light.

4. The process according to claim 1, wherein providing the nanostructured substrate surface comprises patterning the support by a method selected from the group consisting of nanoimprint lithography, electron beam lithography, photolithography, and combinations thereof.

5. The process according to claim 1, wherein providing the nanostructured substrate surface comprises patterning the support by nanoimprint lithography.

6. The process according to claim 1, wherein forming the conformal continuous metal coating is carried out by a method selected from the group consisting of vapor deposition, sputtering, casting, coating, electroplating, and combinations thereof.

7. The process according to claim 1, wherein the periodicity is 500 nm or less.

8. The process according to claim 1, wherein the periodicity is in the range of about 5 nm to about 500 nm.

9. The process according to claim 1, wherein height of each nanostructure is 200 nm or less.

10. The process according to claim 1, wherein height of each nanostructure is in the range of about 100 nm to about 200 nm.

11. The process according to claim 1, wherein each nanostructure has a cross sectional dimension in the range of about 10 nm to about 250 nm, the cross sectional dimension being defined along a transverse axis of the nanostructure.

12. The process according to claim 1, wherein the continuous metal film comprises a metal selected from the group consisting of gold, silver, copper, aluminum, and combinations thereof.

13. The process according to claim 1, wherein the continuous metal film comprises aluminum.

14. The process according to claim 1, wherein the color image is observable using a bright-field illumination.

15. A method for generating a color image, the method comprising irradiating visible light from a broadband visible light source on a nanostructured metal film or metal-film coated support obtained by a process for plasmonic-based high resolution color printing, the process comprising:

a) providing a nanostructured substrate surface having a reverse structure geometry comprised of nanopits and nanoposts on a support;

b) forming a conformal continuous metal coating over the nanostructured substrate surface entirely to generate a continuous metal film comprising a solid metal substrate and nanostructures on the solid metal substrates for the plasmonic-based high resolution color printing, wherein a periodicity of the nanostructures is equal to or less than a diffraction limit of visible light; and

c) separating the continuous metal film from the nanostructured substrate surface by peeling the continuous film formed over the nanostructured substrate surface entirely, from the nanostructured substrate surface,

wherein plasmonic resonances generated by the nanostructures when the nanostructures are irradiated with the visible light from the broadband visible light source absorb one or more colors of light, and the nanostructures reflect one or more other colors of light, thereby generating the color image; and

wherein the visible light is a broadband light.